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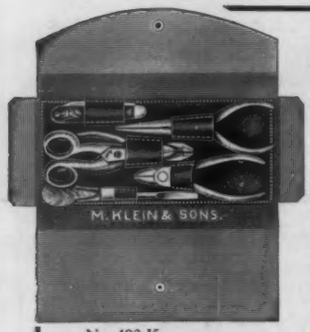

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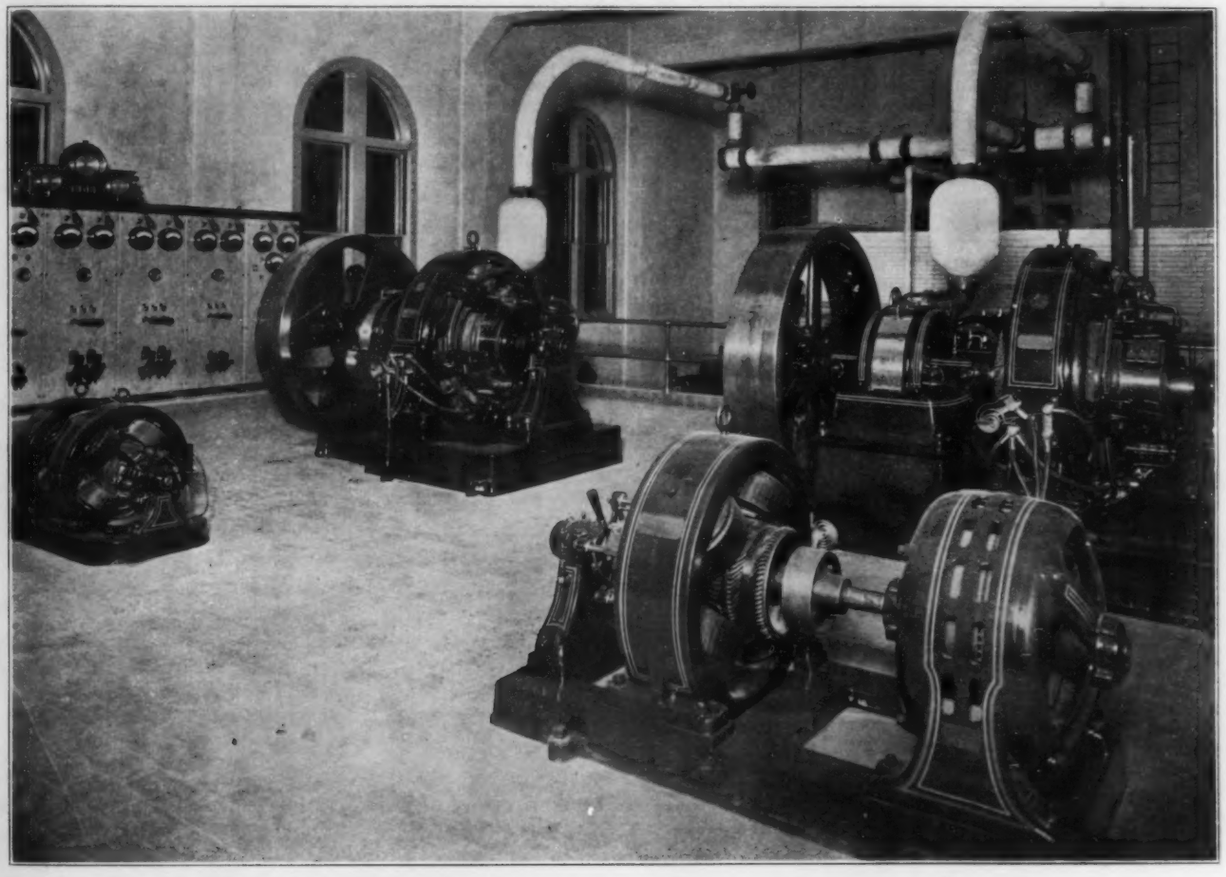
VOLUME XXII. SAN FRANCISCO, APRIL 17, 1909 NUMBER 16

A MODERN HOSPITAL POWER PLANT.

BY C. F. BRAUN

Following the destruction of their old hospital building in the San Francisco disaster, the Southern Pacific Company immediately began plans for a new and larger institution. As a site, an entire block facing on Golden Gate Park was secured, and in February, 1908, work was begun on what is now the most complete industrial hospital in the United States, a hospital capable of caring for over two hundred and fifty patients. It may be interesting to the reader to know that this hospital is supported by the employees themselves, by a tax of fifty cents per month, levied on each and every employee, who in return is insured the best medical care and attendance in case of sickness or accident.



Power Plant of New Southern Pacific Hospital, San Francisco

Heat, light, power and water are all supplied by a complete isolated plant, which it is the purpose of this article to describe. The power plant is housed in a modern concrete and brick structure, in which utility and architectural beauty have been harmonized, and as is characteristic of the other parts of the institution, no expense has been spared to give the plant a finished and pleasing appearance. The boiler settings are of

glazed brick, the engine-room floors of maroon tile, the engine finish is exceptionally fine, and all exposed pipe and fittings are of finished brass.

BOILERS.

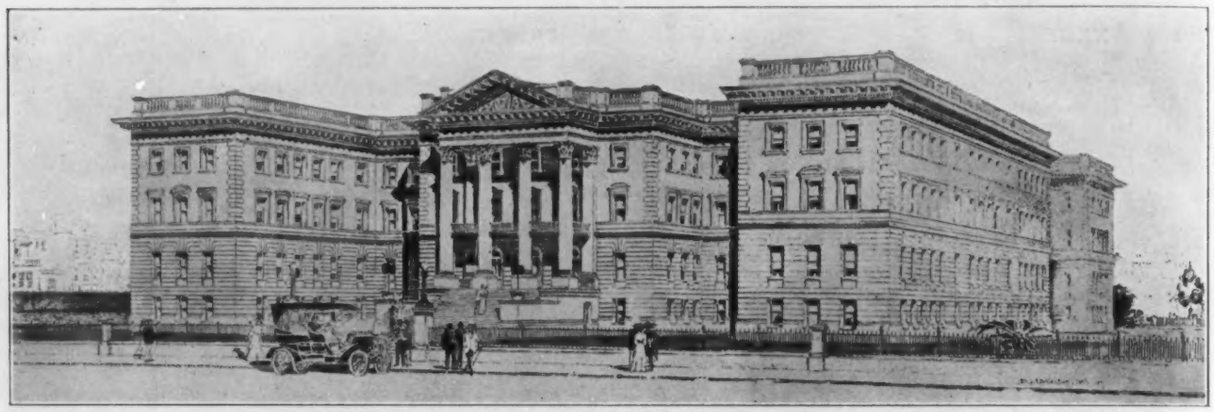
Steam for the engine-generator units, for the Webster heating system and for hot water service, is supplied by a battery of two 150 h. p. water tube boilers, operating at 160 lbs. pressure. California crude oil is the fuel used, the fuel handling apparatus consisting of two 4½" x 2¾" x 4" duplex steam driven pumps, which draw oil from a large storage tank, 10,000 gals., outside the building footings, passing it through heater and strainer to the burners. The heating of the oil is accomplished by means of a small coil on the outside of which the oil pump exhaust is allowed to pass. A set of five ¼" x 3½" x 5" duplex steam driven boiler feed pumps, a set of 6" x 9" x 12" direct acting vacuum pumps for the heating system, and a 400 h. p. Webster open heater, complete the boiler-room equipment.

Exterior of Power Plant

The stack is a part of and harmonized with the rest of the building. It is 36 inches in diameter and 50 feet high, the lower 20 feet being lined with vitribestos tile.

PIPE TUNNEL.

All pipes from the boiler room to the main buildings are led out through a 4' x 8' reinforced concrete tunnel, which passes on a level from the boiler-room floor directly underneath the engine room, and thence to the buildings. The engine exhausts are led into this tunnel, as are also all drips, and all electric wiring to and from the generator room.



New Southern Pacific Hospital, San Francisco.

ELECTRICAL DISTRIBUTION SYSTEM.

In view of the demand for direct current by special apparatus and by elevators throughout the hospital, it was decided to install a direct current plant, the distribution to be on a 125-125-250 volt three-wire system. 125 volt high efficiency lamps are used throughout, and elevator and other motors are operated at 250 volts.

GENERATING EQUIPMENT.

The generating equipment is of special interest, in that two-wire 250 volt generators were used, balancing of the three-wire system being accomplished with a motor generator balancing-set and that with this arrangement exceptional regulation and results have been obtained.

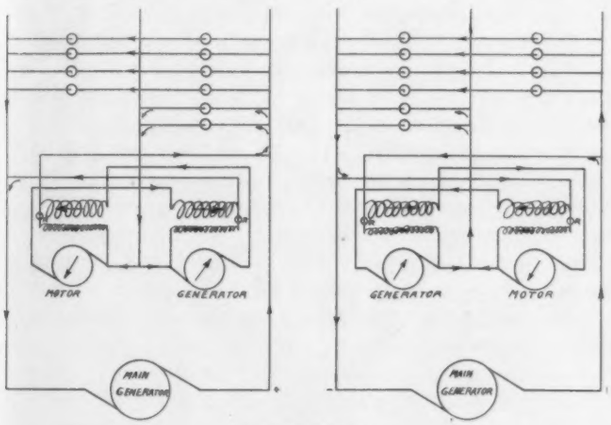
The main generating equipment consists of two 75 k. w. 250 volt two-wire direct current generators, each directly driven by 120 h. p. simple automatic engines running at 275 r. p. m. A 30 k. w. 250 volt two-wire direct current generator directly driven by a two-phase 900 r. p. m. induction motor is provided as an auxiliary, the motor being connected to the local power company's service, which is 250 volt alternating current. The series fields of all three generators are connected in multiple through one pole of each main generator switch, this providing for satisfactory operation of the machines in parallel. The series field coils of the machines are strong enough to give 10 per cent higher voltage at full load than at no load, an adjustable shunt being provided on the series fields for obtaining the desired value. This adjustment may also be used to compensate for drop of speed on the engines. The voltage rise is proportioned to the load increase, making the curve for various loads, approximately a straight line.

The motor generator balancing set, which is connected across the three-wire system, was designed to regulate with a maximum current in the neutral wire of 150 amperes, within two volts, but, it will be seen

later, this figure has been surpassed. The connections for this balancing set are shown in the accompanying diagram. It will be noticed that the shunt field of each machine of the set is excited from the opposite side of the system, this tending to raise the voltage on the low side. The series field of each machine of the balancing set is in series with the armature of the opposite machine, thereby compounding one machine with the armature of the other. Tracing through the direction of current in the various windings, the reader will note that the machine, acting as generator, is cumulatively compounded, while the machine acting as motor is differentially compounded. The cumulative compounding in the generator field tends to raise the voltage on the low side and the differential compounding of the motor field tends to maintain constant speed. Running under unbalanced load the motor takes considerably more current than the generator, and if compounded with its own current, would tend to flash over much sooner than when compounded with a smaller current of the generator; while the generator being compounded with the larger motor current, has a stronger tendency to hold the voltage up. Under test and without any movement of the brushes or rheostats, this set showed the following regulations:

Current in neutral.	Volts, motor side.	Volts, generator side.
0	116.7	116.7
30	117.2	116.3
70	117.8	115.8
130	117.1	115.6
150	115.5	116.9

It is thus seen that the voltage varies from normal but one volt, or less than one per cent, this regulation



CONNECTION DIAGRAM
COMPOUND WOUND BALANCING SET.

being obtained through the entire range of the balancing set automatically and without any operation whatever of the rheostats. The machines reverse their functions, passing through zero to the opposite extreme with the same results. This is something, the writer believes, that no three-wire machine will come anywhere near doing. The balancing set has the additional advantage in that for long continued unbalancing on the system the rheostat can be adjusted so that the voltages on the two sides of the system are exactly equal.

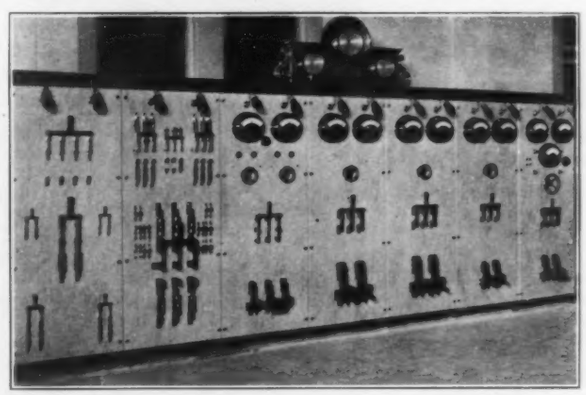
When the decrease in the life of lamps run above voltage and the great reduction of candle power due to low voltage are considered, the value of this close regulation is manifest. For the ordinary 3.1 watt lamp burned at a voltage 2 per cent below normal, Foster gives a corresponding candle power decrease of 11 per cent and wattage increase to 3.34. For the same lamp burned at 2 per cent above normal, a decrease in life of 40 per cent is given. The new high efficiency lamps are not quite so seriously affected, perhaps. The standard regulation guaranteed for three-wire generators is 2 per cent above and below normal.

For operation, the balancer set requires 7.5 amperes. This, however, is offset by the greater efficiency in the two-wire generator over that of the three-wire machine, additional windage and friction in the three-wire machine bringing the efficiency of this type of machine to at least 2 per cent below that of the two-wire machine of equal capacity. When the use of standard two-wire apparatus, simplified wiring, and reduction of first cost are further considered, the superiority of the three-wire generator in any respect to an arrangement such as this, is not apparent. The danger of violent short circuiting encountered in "throwing in" some three-wire machines in parallel, is also eliminated with the use of the balancer. The electrical machinery was built by the Electric Machinery Company of Minneapolis, Minnesota.

SWITCHBOARD.

The switchboard consists of seven panels, three generator panels, a panel for the induction motor, a balancer set panel, and two distributing panels, one lighting and one power. The panels are of uniform size, 30" x 76", of a single piece of blue Vermont marble 2 inches thick.

On each generator panel are mounted a voltmeter, an ammeter, a double pole plain overload circuit breaker, the field rheostat, and a three-pole knife switch, through the middle pole of which the equalizer lead is connected to the equalizer bus.



Switchboard

On the motor panel are mounted an ammeter for each phase, a voltmeter with plugs and receptacles, a double pole plain overload circuit breaker, a triple pole main switch and a large hand-wheel for operating the motor starter at the rear of the board.

On the balancer panel are mounted a differential ammeter, a differential voltmeter, a triple pole plain overload circuit breaker, the two field rheostats, a triple pole double clip resistance starting switch, and also the ground detector lamps of the system. It will

be noted that the switching arrangement for the balancer set is simplicity itself. The three pole double clip switch serves to start the balancer, cut-out resistance, and connect the neutral, and is absolutely foolproof.

All distributing switches on the lighting panel are double throw, the lower studs being connected to a separate set of busses that are connected to the local power company's alternating current service. Thus, light for the hospital is insured without running any machinery whatever in the plant. If, however, power for the motors are required, the motor generator set must be started. The institution is thus protected even in the case of entire shut-down of the steam plant.

Above the board and supported by ornamental copper work, are mounted the engine-room clock and boiler steam gages. All metal work on the board, including instruments, is copper finished, and the board is in general keeping with the handsome appearance of the plant.

ENGINES.

In view of the fact that all exhaust would be made use of in the steam and hot water systems, a highly economical engine was not particularly desired, but rather a simple engine with good regulation and with few parts to give trouble. American Ball simple engines with cylinders 14″ x 12″ were installed.

WATER SUPPLY.

To secure a good and sufficient water supply wells were sunk to a depth of about 100 feet. The water was found to be so gritty that an air lift was determined upon as being superior to any form of plunger pump. A small 6″ x 8″ air compressor, driven by a 5 h. p. motor in the boiler room ,provides the air. The air lift delivers the water to the suction of a 2-inch centrifugal pump driven by a 3 h. p. motor, which in turn forces the water to the large supply tank located on the roofs of the various main buildings. This arrangement has been found to be very satisfactory, the gritty water having no deleterious effects on the air lift or pump runner. The capacity of the pumping equipment is 7,200 gallons per hour.

Great care was exercised throughout to make the plant a model one, D. J. Patterson was supervising architect and the Standard Engineering Company, power engineers, San Francisco, installed the plant, the boilers being supplied by the Parker Boiler Company.

Conservation in California is to be discussed at the meeting of the Counties Committee of the California Promotion Committee to be held May 8, 1909, at Hotel Del Monte, Monterey. Papers are to be presented by Government officials.

Wireless telegraph for the Panama Canal is to be furnished by a station being erected at Porto Bello by the Navy Department. A mast 130 feet high will be erected on one of the hills at the entrance to the harbor. The station will be used for general naval purposes and for transmitting official messages of the Isthmian Canal Commission between Porto Bello and the wireless station at Colon.

THE CONSERVATION OF OUR WATER POWERS.[1]

BY JOHN F. VAUGHAN.

There are two subjects we have heard a great deal about lately: (1) The combining of corporate interests, and (2) the conservation of our natural resources.

Probably the most important example of corporate combination has been in the merging of steam railroads into a few comprehensive systems. This has been followed by a more or less successful movement to consolidate lighter electric railroads, with a tendency further to combine these with the older steam roads. And now in the development of high-tension electrical transmission we have the physical means of combining widely scattered water powers, and in the adoption of electricity as a distributing medium a strong incentive for the combination of interests of all three of these classes: Heavy and light railroads and water powers.

As a matter of fact, the combining of steam and electric railroads has already begun, and now there is scarcely a steam road in the country which is not seriously considering electrification of at least a part of its system, and there are many which are either acquiring or are actually developing water-power privileges to furnish them with motive power. Here, then, among the railroads we find a common interest in the economic development of our water powers.

The second subject—that of the conservation of our natural resources—in its bearing on the welfare of the country is of general interest to railroad men, and as far as it affects the regulation of stream flow is of especial importance to them wherever water power is available. As traffic grows, as train weights and speeds increase, and fuel becomes more scarce and inaccessible, water must be more and more depended upon for power.

The present rate of deforestation, increased as it is by fires set by passing locomotives, in its effect on the reliability of water powers, and on the increase of damage by flood, demands serious consideration.

The following conservative estimate of the water-power resources of the country has been published recently by Mr. Van Schon. He gives the amount of water power already developed as 2,050,000 horsepower, and the available undeveloped power, without the help of storage, as 10,000,000 horsepower.

Now, what are the requirements for the successful development, and why has it not been more rapid? The reasons have been partly lack of available market for the power, partly the excessive cost of development and partly the difficulty of stream regulation. With the old type of water wheel and costly mechanical transmission, it was necessary to use the power at the wheel, and then with perhaps only a part of the fall available without elaborate and costly canal systems. The more recent turbine and yet newer impulse wheel, although utilizing the full head of the fall, have been still hampered by the necessity for using the power near the fall. But now with the growth of electrical transmission not only can remote markets be reached, but powers formerly inaccessible may be developed and operated singly or in groups, for better economy and efficiency. Thus the differing characteristics of power markets may be largely equalized and better

[1] Extracts from a paper read before the New England Street Railway Club.

service and larger returns obtained from the investment.

The best examples of the consolidation of water powers are in the California system, where plants scattered through the mountain canyons feed into common networks of transmission lines, serving large territories with power for railway and industrial plants, pumping, etc., and in some cases delivering the discharged water for irrigation; and the best example of combination of markets is in the great systems of Niagara, delivering power over hundreds of miles of lines for an infinite variety of uses.

We have good examples of the use of water power by railroads in the plans of the Chicago, Milwaukee & St. Paul, which is already making the initial development of some 200,000 horsepower available in 35 miles of the St. Joe River, for operating its trains electrically over the Great Divide, in the electrification of the Cascade tunnel of the Great Northern Railroad, in the conversion of the Harriman lines around San Francisco, in the equipping of the New York Central for operation by Niagara power, and in many light electric railroads all over the country.

Let us see what the principal requirements for the economical use of our water powers are:

Stream flow should be controlled so as to get the maximum energy out of the stream as a whole, and not merely for the benefit of certain isolated plants. For instance, no one plant with storage should be allowed to hold back the natural flow when required by down-stream users who have no storage to draw on, or to flood them with excess water when detrimental to their interests.

The storage facilities of the drainage basin should be developed as far as practicable for steadying the natural flow of the river, increasing the capacities of the various developments and reducing trouble and damage from floods. For instance, since any development over and above the capacity of the minimum dry-season flow of the stream must be relayed by other power, or the excess sold as cheaper secondary power subject to interruption, even an average stream will waste more power than it can use, and a torrential stream, which may flow in flood over one hundred times its low flow, will give up only a few per cent of its total energy. It is evident that expensive storage cannot be accomplished without the co-operation of the power users and an equitable sharing of the expense.

As far as possible various plants should be tied together to feed into a common network of distributing lines so as to utilize the stream flow to its best advantage, to equalize local peaks and irregularities of load, to reduce surplus investment in spare and breakdown capacity, to cut down distribution costs, and to improve the regulation of the system. By such combination the number of units in each plant may be reduced, hydraulic and electric designs simplified, complication of switching and control cut down, and a corresponding saving made in fixed charges and operating costs. In this way many communities may be served which otherwise could not support the burden of individual development.

Arrangement with other power producers should be considered for the interchange of surplus power, especially where the peak demands are not simultaneous. For instance, an agreement between a lighting company and a coal mine in Pennsylvania for the interchange of power up to 2500 kilowatts, where the mine shuts down before the peak of the lighting load, now enables each to reduce its fixed charges on spare equipment and to improve its load factor.

Surplus power during light demand, or surplus water, should be utilized for industrial purposes, such as pumping, electrochemical or metallurgical processes. For example, the electrical recovery of peat from wet bogs and the manufacturing of fertilizers and certain other products of modern chemistry from nitrogen recovered from the atmosphere are not wholly visionary, nor is it necessarily crazy to use surplus flow to pump water into reservoirs above the natural water levels for use during dry periods or excessive loads. In certain localities surplus or discharged water should be utilized for water supplies or irrigation. Groups of plants now on the old series canal systems, or plants otherwise inefficient in the use of water, should be redeveloped.

There are, of course, many obstacles to overcome before our streams can be properly controlled and their power utilized to best advantage; legal tangles to straighten out, franchise restrictions to modify, dams to build and to rebuild, and innumerable physical and operating details to work out. But water is a permanent asset which is neither burned up like fuel nor carted off like our mineral resources, but returns with every fog and rainstorm to be used again.

In the interdependence of the territories embraced by the various watersheds our interests in this asset become national, warranting Federal control, or at least State action under Federal supervision, and already we have in the hydraulic work of the New York State Water Supply Commission, established under the Fuller bill, a substantial advance made in the study of the storage possibilities and in its effect on present and future water powers of the State, and in the National Conservation Commission, appointed by the President, a definite establishment of Government policy. Both of these commissions recognize that the conservation of our water supply is of sufficient importance to call for comprehensive plans of water storage and stream control, and that the Government should eventually distribute the cost of such improvements among all interests in proportion to the benefits received.

On this basis, then, the water-power interests will be required to carry only a burden in proportion to the benefits they receive; and such a policy will not only enable individual enterprises to develop their resources to best advantage, but will give their properties a more definite and permanent value.

In this general movement toward stream betterment there is a definite beginning of a more economic use of our water-power resources, and in the growth of electrical transmission a means of reducing both first cost and operating expense. And from whatever point we view the matter we have plenty of reasons for encouraging the conservation work already begun by the Government and, in addition, plenty of opportunity for studying the improvement of our existing powers and the development of new.

ABSTRACT OF THE AMERICAN TELEPHONE AND TELEGRAPH COMPANY'S ANNUAL REPORT.

A general statement covering the business of the Bell system is included by President Theodore N. Vail with the annual report of the American Telephone and Telegraph Company.

There was a total of 4,364,629 telephone stations connected to the Bell system as against 3,839,000 at the close of the previous year, an increase of 525,629 stations. Of the total there were 1,103,144 exchange and toll stations connected to the Bell system by toll or long distance lines, but operated by some 7,700 local, co-operative, and rural independent companies or associations having sub-license or connection contracts.

The total wire mileage of the Bell companies for toll and exchange service was 9,830,718, over a million miles being added during the year. The daily average of calls handled by the Bell companies was 18,963,000, or at the rate of about six billions a year. The plant additions were $15,824,000 for exchanges, $8,812,600 for toll lines, and $2,000,600 for land and buildings, making a total of $26,637,200. During the past nine years a grand total of $378,472,800 has been expended in enlarging the Bell properties.

During the year $39,736,700 was applied out of revenue to maintenance and reconstruction purposes.

The report shows that the maintenance of the property is well provided for, and that that the plant itself is assuming a more permanent character, due chiefly to the increased proportion of copper wire and underground conduits and cables.

Of the total value of the telephone plants owned by the American Telephone and Telegraph Company and associated companies, real estate constitutes 9 per cent, underground conduits and cables 20 per cent, copper wires and aerial cables on poles 18 per cent, pole lines, not including wires, 26 per cent,—$8,000,000 of this represents ownership of rights of way over private property—iron wires 4 per cent, central office equipment 23 per cent.

The associated operating companies show reductions in floating indebtedness and increases in cash on hand, a net improvement of $5,004,000. The Western Electric Company shows an equal improvement, so that the current and floating indebtedness of the associated companies is well within the limits of current operations.

President Vail shows that the real or replacement value of the Bell plants is largely in excess of all outstanding obligations.

The Bell business as a whole, excluding duplications and treating it as if operated by a single company, showed a substantial improvement. The total earnings showed an increase over the previous year of $7,009,500, the total expenses an increase of $3,101,100. The balance of net earnings was $45,974,000, and, after deducting $11,034,500 for interest and $21,338,100 for dividends, there was left $13,601,400 in undivided profits. The combined balance sheet shows total assets of $680,044,200, with a surplus of $31,759,600, and depreciation and other reserves of $40,480,300.

The earnings of the American Telephone and Telegraph Company also show a decided improvement over last year and every previous year. The net revenue was $18,121,707.26, out of which dividends of 8 per cent were paid, amounting to $12,459,156, leaving a surplus of $5,662,551.26.

There is shown a considerable increase in the number of shareholders, there being at the end of the year 26,370 shareholders with an average holding of 60 each. By means of the issue of the balance of the authorized $150,000,000 convertible bonds, the financing of the company and its associated companies is completed for 1909 and 1910, including the payment of $31,000,000 notes maturing during those years.

The American Telephone and Telegraph Company's relations to the associated companies are explained in considerable detail. Primarily a holding company, it also owns and operates the long distance lines which connect the systems of the associated companies. In addition to these two functions it assumes what might be termed the centralized administrative functions of all the associated companies. The Bell system is one system telephonically interconnected, intercommunicating and interdependent. It was built up on the policy that any one of over 4,000,000 subscribers can talk with any other one within the carrying power of the voice over the wires. New ideas, inventions and methods are examined, perfected, and made universally available.

The report says: "There has not been sufficient distinction between the 'Independents' and the 'Opposition' in the minds of the public. We have no quarrel with either. With many of the Independents we are working in complete harmony, and for all practical purposes our system is a part of theirs and their system is a part of ours." On the other hand, President Vail says that there is a decided tendency on the part of the public to favor consolidation.

In general, the report calls attention to the fact that there are over 70,000 shareholders in the Bell system. The business has shown an increase from year to year, no matter what the prevailing business conditions. The Bell system, under an intelligent control and broad policy, has developed until it has assimilated itself into and in fact become the nervous system of the business and social organization of the country. This is the result of centralized general control exercised by the company, the combination of all local systems into one combined system developed as a whole. There are no other countries where the telephone service occupies the same relation to the public. It is shown that the average rate of this country, taking all classes of service and conditions into consideration, is about the same as the average rate of all other countries. Cheapness is relative to value, not to price. Value in telephone service depends on development, extent of system, certainty and promptness.

In the concluding statement regarding public relations the report says: "During the year we have had many questions before the courts, state commissions, and other public bodies. We have met them in a spirit of absolute frankness and candor. The results have been on the whole satisfactory, and the treatment we have received has been fair and considerate, and we have found an evident desire to ascertain the real conditions and to meet them fairly."

JOINT POLES IN SOUTHERN CALIFORNIA.

BY J. E. McDONALD

In the City of Los Angeles are two telephone companies, three lighting companies and four electric railway systems, all of which are operating independently, having constructed immense distributing systems and branches to many of the outlying towns and cities within a radius of one hundred miles of this southwestern metropolis. Such rapid development was accompanied to a marked degree by the "Pole Nuisance," which is now being overcome to a large extent.

The Old Method.
Five Companies Set Poles Independently on Private Property Lines.

The Joint Pole Committee of Los Angeles is a committee of representatives of the various utility companies, and has for its object the elimination of all unnecessary poles outside of the regular conduit districts established by city ordinance. The Pacific Electric Railway Company, Pacific Light & Power Company, The Los Angeles Railway Company, The Edison Electric Company, The Los Angeles Gas & Electric Company, The Los Angeles Pacific Company, The Pacific Telephone and Telegraph Company, and The Home Telephone and Telegraph Company are actively engaged in this commendable work, as well as a number of outside or subsidiary companies, which participate to a lesser degree. The committee has an organization operating in a measure independently from any of the parent companies, but under the jurisdiction of the authorized members selected by the various companies interested. Combinations are arranged for and recorded through the secretary, who handles the details and provides for an equitable settlement on all combinations. The committee was organized for active work February 1, 1907, and during the two years to date have accomplished a great deal toward bettering local conditions. During this period, combinations have been made on over ten thousand poles in and around the city of Los Angeles, thus eliminating entirely a much larger number of poles which would have been necessary without combination.

An Intensive Combination.
3 15,000-Volt 3-Phase Circuits; 2,200-Volt Primaries With 440, 220 and 110 Volt Secondaries; 6,000-Volt Series Street Lighting Circuit; 500-Volt Railway Feeder; Railway Telephone and Span Wire.

Los Angeles is a city covering a very large area. An extension to outlying sections of the conduit district would be impracticable under the favorable rates given to patrons of the utility companies, and the joint pole proposition has solved this otherwise vexing problem.

Popular agitation with reference to the company's poles has almost ceased entirely since the adoption of this co-operative method, and has helped the companies themselves in making construction better and cheaper, promoting harmony among the operating officials of the various companies, whose business interests must be in direct opposition.

The committee through the secretary relieves the companies of all details relating to joint construction maintaining with each company at an extremely low cost, a duplicate file of all combination work.

DIRECT CURRENT 1200 VOLT RAILWAY EQUIPMENT.

Discussion by members of the San Francisco Section, American Institute of Electrical Engineers, of a paper read by Mr. S. B. McClenegan and published in the Journal of Electricity, Power and Gas, of April 3, 1909. The following took part in the discussion:

C. W. Burkett, Chief Engineer Pacific Telephone & Telegraph Company, San Francisco, Chairman.

S. B. McClenegan, General Manager, Central California Traction Company, Stockton.

Carl Heise, Westinghouse Electric and Manufacturing Company, San Francisco.

R. W. Lohman, Electrical Engineer, San Francisco.

W. J. Davis Jr., Electrical Engineer, with General Electric Company, San Francisco.

Lars Jorgensen, Designing Engineer, with F. G. Baum & Company, San Francisco.

W. W. Briggs, District Manager, Westinghouse Electric and Manufacturing Company, San Francisco.

W. F. Lamme, Construction Department, Westinghouse Electric and Manufacturing Company, San Francisco.

C. L. Cory, Professor of Electrical Engineering, University of California.

H. W. Clapp, Engineer Southern Pacific Company, San Francisco.

A. J. Bowie, Consulting Engineer, San Francisco.

H. W. Crozier, Electrical Engineer, with Sanderson & Porter, San Francisco.

G. A. Hearn, Electrical Engineer, V. B. & N. V. R. R. Company, Napa.

Carl Heise: I have not had any personal experience with 1200-volt apparatus. The Westinghouse Company has never developed that line. Our work has been altogether in the development of the single phase road. Mr. McClenegan brought out one point, which was that the motor generator sets were not fully loaded, and therefore the efficiency of the system was handicapped. That is one of the strong points that we claim for the single phase system inasmuch as, independent of the length of the line, the entire load of the system is on one set, and the set can be proportioned so that the average load on the frequency changer or the station (whatever it happens to be) is high at all times, and the efficiency of the conversion apparatus is therefore pretty high. I do not believe that there is any doubt about the successful operation of 1200-volt apparatus, and the only feature that has ever appealed to most of us is the question of universal application of the system.

R. W. Lohman: Will the author kindly give us some details regarding the 1200-volt generators? Are they two generators in series, or one generator?

S. B. McClenegan: One straight 1200-volt generator, which in appearance is almost identical with the ordinary 550-volt type.

R. W. Lohman: They are driven with a synchronous motor.

S. B. McClenegan: Yes.

R. W. Lohman: How are the synchronous motors started?

W. J. Davis Jr.: They are started as an induction motor, a self-starting motor; it has no starting motor on it.

R. W. Lohman: It might be of interest to say in connection with the third rail construction, that while the speaker spoke of having installed a rail with 400,000 circular mil section equivalent to a 40-pound rail, at a cost of $3,250 per mile, the New York Central type, consisting of 22 pound bullhead rail cost $5,200 a mile or $1 a foot.

S. B. McClenegan: Their conductor is very much heavier than ours—70 pounds; ours is the 40-pound rail. I very much question the use of the rail we have. I think much better results can be got by using the bullhead rail, such as the New York Central employs. That of course was a special rail, the ingredients of which were designed for a conductor. Ours were merely a standard rail. But I think another time a special rail should be got for that purpose.

R. W. Lohman: What form of bond?

S. B. McClenegan: A soldered bond on top of the rail, on the flat side; the bottom of the rail is uppermost, and this bond is laid on top and soldered there. There are no special features in connection with them.

R. W. Lohman: I would like to ask if there is any excess of output.

W. S. Davis: I should not think the load factor on the station at present is over 25 per cent. They are running about 17 miles. With the extension there will be about 25 or 30 miles of road on that sub-station, on which we might expect a load factor of 40 or 45 per cent. We ought to get 15 per cent or better in the efficiency of the motor set, a 500 kilowatt motor generator set, with a load of only one car on it. The load factor is very unfavorable to good economy.

S. B. McClenegan: One-third of the time there is no load on it at all, and of course, the efficiency must be very unfavorable under those circumstances. A single sub-station of 1,200 volts is good for about 20 miles of line, as compared with 10 miles for the ordinary 550 volts.

R. W. Lohman: That is, without feeders.

S. B. McClenegan: Yes, without feeders. There are no feeders employed in our case; it is only the rail itself. As I said, the rail has a capacity of 400,000 circular mils.

R. W. Lohman: Are those operated 1,200 in series?

S. B. McClenegan: 1,200 straight.

Lars Jorgensen: Before rapid progress can be made in superceding steam by electricity on trunk lines, some high voltage traction system is necessary. We have today three different systems of electric traction, none of which in their present state of development would fulfill all requirements necessary to justify the change from steam to electricity. They are, however, all making rapid progress in their development.

The single phase commutator motor is at present a factor in railway engineering problems, especially on account of its promising possibilities of improvements in the near future. The last few years have witnessed the advent of several types of single phase commutator motors, each of which were an improvement of the old induction type single-phase motor without commutator.

The polyphase system is an ideal one in many respects and is also advancing a good deal in development. Its greatest disadvantage is that it requires two trolley wires, which are objectionable, especially at crossing, and its small speed flexibility, if not provided with commutator or other devices which makes the construction complicated.

These two systems have the advantage over the third and most highly developed, the direct current traction system, in greater economy of power transmission. The spacing of the sub-stations can be greater, thereby loading them more uniformly with infrequent train service. While it would greatly improve the load factor to run single cars, it would increase from 100 to 200 per cent the power required to haul a train of a given weight a certain distance, at least at high speeds, where the air resistance is considerable and where the track resistance is also increased.

The 600-volt direct current system has perhaps nearly reached its height of development. At this voltage, however, the sub-stations would have to be spaced close together. The maximum distance apart could not be over between eight and ten miles. With the comparatively infrequent service existing on main lines it would be impossible to obtain any kind of a uniform load; therefore, the average efficiency of sub-station apparatus would be exceedingly low.

With twice the voltage applied to the line the distance to which power can be transmitted with equal economy is four times greater. This will influence the spacing of the sub-stations very considerably and to such an extent that operation of main line trains with 1200-volt becomes not ideal by any means, but practical. At first sight it would seem reasonable to space the sub-stations four times as far apart for 1200 volts as for 600 volts. There are, however, other things than just the

drop in the feeders to be considered, and the proper spacing figures out to be just twice, or between 16 to 20 miles for 1200-volt, If a train is running at least every 20 miles the sub-stations will be uniformly loaded and the 1200-volt direct current system will answer the purpose.

The 120° volt direct current motor is as efficient and as light for a given temperature rating as the 600-volt motor and the commutation is even improved in the 120° volt motor, at least in large sizes on account of the decreased current. The total brush surface will be correspondingly reduced, thereby making greater space available for armature and windings and motors of larger capacity can be mounted on standard trucks with given driving wheel diameter and gear ratio. This is an important point in favor of the 1200-volt system, when considering trunk line electrification, where a large amount of power is necessary.

The Chairman: Have we any other remarks on this subject or questions to ask? I would like to hear from Mr. Briggs on this subject.

W. W. Briggs: I am afraid I cannot add much to what has been said, as I am as much in the engineering field as in the electrical field. I might have more to say if I had known what was going to be discussed tonight. I have not had a great opportunity to really realize what was going to be presented. I am impressed with some of the statements that Mr. McClenegan made with reference to economy, but I do not believe that we would suffer by comparison. However, I do not want to bring up any discussion, commercial discussion.

The Chairman: That is what we are here for. Anything to do with engineering?

W. W. Briggs: We had a paper presented here on the alternating system and there was a large silence on the proposition of load factor on the single road. On the natural load the load factor has been improving right along, and as a consequence an improvement in the current consumption. There is still improvement to be made there yet in the gear rate of their motors. I think in a great many cases in the roads installed in the West that they have not taken that into consideration as much as they should have done in laying out their plans. The tendency is to lay out now high speed and then accelerate all the time. That is principally owing to the fact that the motormen would coast down hill with a low gear and would be liable to throw his armature bearings off and tear up his motor. Those conditions are all being properly met, and I think the 1200-volt direct current has got its place as well as the alternating, and it will only be a short time before they will fit into their particular spheres. The winter that Mr. McClenegan's system has gone through, this last winter, was a very trying one and he ought to be congratulated on the results secured. If the wetness down here may be counted for anything, they must have had much more in Stockton.

W. F. Lamme: I really did not know how the subject was going to be treated, so I am not prepared at all for that reason. However, we engineers like figures, we like to be a little exact if we can. In the last two years the engineers had been very active in gathering figures. There is one instance in the United States where we can make a comparison between a 1200-volt direct current and an alternating current railroad. That line is about 40 miles long, and the termini are in the same town. In the one instance they have 1200 volts direct current and in the other alternating current single phase. The comparative first costs are about in the ratio of five to four, that is, the direct current costs five dollars, whereas the alternating current costs four dollars. The operating costs are about four to three—the 1200-volt costs four dollars, where the alternating costs three dollars. The energy at the switchboard—a little more exact, is 58 for the direct current and 38 alternating current.

S. B. McClenegan: May I ask the gentleman how his maintenance charges were?

W. F. Lamme: We have no figures on that subject as yet, at all. The 1200 volts has only been running a very few months.

S. B. McClenegan: You have had no losses?

W. F. Lamme: No. I have gone as far as we could. What I mean is, that we have had no maintenance charges on the 1200 volts as yet.

R. W. Lohman: Now that the conversation has veered around to the question of economy, the author of the paper said that with the G. E. No. 73 on the 600-volt direct current the power consumption averaged 5.23 kilowatt hours per mile, and with the G. E. 205 on the 1200 volts it was 4.74. If the power weighs 35 tons that reduces it to 84 and 95 per kilowatt hour per ton mile with an efficiency on the alternating current to the car of 60 per cent; 84 and 95 per kilowatt hour would seem to be a little high unless the number of stops were considerable. Have you made tests?

S. B. McClenegan: I cannot say. But we have an excessive number of stops to make. I suppose we stop in a run of 15 miles from 15 to 20 times sometimes.

W. J. Davis: Sixty per cent is a trifle high for this system, inasmuch as you have a 500 kilowatt generator set operating about two cars. I should think that 45 or 50 per cent would more nearly represent the average efficiency of the system; probably less than that; and that would bring the watt hours per ton mile to as much as you would expect under ordinary conditions.

R. W. Lohman: Take the generator at 90 and the motor at 90 and the line at 80.

W. J. Davis: You are running a set sometimes for 15 minutes or no longer with no load and then one car will go on and two cars for a little while, so that an efficiency of 70 per cent for the motor generator set I should say would be probably higher than we are getting. With the 1200-volt system there is a saving in losses in the distributing system which would probably amount to five to eight per cent.

The Chairman: I am disappointed that Mr. Babcock, the electrical engineer of the Southern Pacific Company, is not with us tonight. He has done a great deal of work in the last few years in this electric traction matter—in fact, he is the man up against the job, and those men should give us an interesting story. Professor Cory is with us tonight and we would be favored by a few remarks from him.

C. L. Cory: I wish to say that I was very much interested in the relation of the actual experiences of a man who can view the operation of a railway system, not only from the purely engineering standpoint, but also perhaps from the broader standpoint which I dare say is ultimately reduced at the end of the year to dollars and cents rather than to anything else.

Of course we have here a road that is not exactly typical of the use of high voltage current; in other words, as it is operated today, with comparatively short mileage, it is not what might be expected from a road with two or three or four times a mileage with a corresponding increase in the number of cars.

We cannot get away from the fact, as has been stated very definitely this evening, that from the standpoint of feeders, if we increase the voltage from six hundred to twelve hundred we are really increasing distances by the square of the increased voltage or four times. We are then beginning to get into the field of the high voltage transmission, which of course has been so peculiarly adapted to alternating current; and inasmuch as the single phase motor seemingly at the present time is permanently the variable speed motor of the alternating current system; the single phase railway system that has been developed and has at least two lines in operation in this state, it is a question as to where the advantages of one will begin to give way and become minor as compared to the advantages of the other. There can be no doubt of the thorough reliability and very small maintenance cost of our old five hundred to six hundred volts direct current fraction system. One point that interested me this evening was regarding the use of these 1200-volt motors in systems on the straight 500-volt or 600-volt trolley, as regards the matter of speed. We all have to deal with the problem of rapid transportation. No transportation system of any character, no matter what the motive power may be, can succeed unless when you get into the suburbs you can get the

people over the ground quickly. We can talk about our peak load for our power plants and our lighting plants all we please, but there is not any system that has its peak load so definitely fixed as the transportation company. Those of you who are ferryboat chasers, like myself, cannot help but realize the problem before the transportation companies across the bay is to meet the work concentrated in the period from perhaps five o'clock until six. Otherwise, the equipment, boats, cars, power stations and everything else is ample for a very much greater capacity or income than the situation might perhaps on the face indicate. We must get people quickly from the business district to the residence district, and it is a question as to how this can best be accomplished. I dare say most of you are familiar with the very extensive system in and around Los Angeles. For instance, from the city of Los Angeles to Long Beach, with its double track, high speed service; also the system of transportation between Los Angeles and Pasadena, and Los Angeles and Santa Monica and Redondo, and so on. There the old five hundred or six hundred volt system is in effect. But the midway point is rather clearly shown by the double voltage or 1200-volt direct current system. I think that engineers and financiers both must at all times be grateful to people who go about things like the early pioneers in transmission in California went about things and also like the Central California Traction Company went about it, with absolutely no precedence whatever; with all the chances to be taken for difficulties, they adopted a rather novel third-rail system for a high voltage, 1200 volts, direct current system. The same thing is true regarding those investors and financiers and engineers that are responsible for the alternating single phase system. Those of you who can remember as far back as the first picture that was shown us tonight, of the horse riding down hill on a car, can remember the maintenance charges of the 500-volt Sprague system was about 150 per cent of the gross receipts of the road. It must be admitted that the maintenance charges are perhaps excessive in some roads that are being developed on new lines, but that is not an impossibility to overcome providing the principle of operation and the possibilities are there.

One thing which interested me this evening is this matter of load factor. If we have a sub-station running for a large fraction of its time at practically no load, and then a sudden demand for power comes upon the plant, we cannot possibly expect the efficiency that we can on a uniform demand all through that time. We can have recourse to the storage battery to increase our uniformity of load, which we would not have in the single phase system; but I do not know where we could get enough money to buy storage batteries for 1200 volts, but I dare say the money would be forthcoming if the saving could be shown to be justified. It is the same thing finally when we come to a conclusion in any matter. There is a place where each system fits most adequately. One point that was suggested this evening is heavy train service as compared with the single car service. I have been wondering this evening as to the adaptability, if you like, of the current 1200-volt system as compared with the single phase system of transmission of power, which is, of course, a very simple problem.

I can only add that I have been very much interested in the experiences as related this evening of this road. I have known a little of it at first hand, but not so very much. It is only by the exchanges of information that we get knowledge, and when we get as definite information as we have this evening from Mr. McClenegan, I think we should be grateful for it.

The Chairman: In the absence of Mr. Babcock can we be favored by a few remarks from Mr. Clapp?

H. W. Clapp: Before I came up here last year I inspected the operation in Indianapolis of two 600-volt machines in series, spending two or three days there with the operating men. What Mr. McClenegan said tonight about the 1200-volt direct current operation was fully borne out by that road. Recently I have been advised that one road in Central Illinois and a road at Milwaukee, where they are operating a single phase system, had decided, due to unreliability of single phase, to change, in one instance, to 600 volts direct current, and in the other instance, to 1200 volts. I think the great drawback on single phase has been, besides a good many first costs that do not seem to be brought out always—such as heavy weight of equipment and necessarily high-class roadbed—the most vital point in it is the very high operating cost, not due to current consumption, maybe, but due to high maintenance, that led them to discharge it in favor of higher voltage direct current. I have not anything to say in regard to our own experience here, because I am in the hands of our engineers.

Carl Heise: With reference to that point of maintenance I would just like to say that I had a report yesterday from the engineer of the Napa road that the last equipment we furnished had made 200,000 train miles without a cent of cost for repairs. As far as the motors themselves were concerned and the control apparatus, it has done something like 150,000 miles and there was only one interruption of service, which was fixed up in ten minutes.

A. J. Bowie: With reference to high cost of maintenance I would like to ask Mr. Clapp of what that consisted, what items?

H. W. Clapp: The high cost of maintenance was largely in car equipment and up-keep generally, motors and accessories.

A. J. Bowie: In the commutator?

H. W. Clapp: In the motors generally.

The Chaiman: Mr. Crozier has had considerable experience in electric traction and we would like to hear from him this evening.

H. W. Crozier: In the first place I would like to ask a couple of questions about the car miles. Do I understand that that consumption of 4.75 kilowatt hours was all on 1200 volts or was the car running part of the time on 1200 and part of the time on 600?

S. B. McClenegan: That was all on 1200 volts.

H. W. Crozier: Did you have any freight or anything else like that?

S. B. McClenegan: That was handled separately. The power used by the express and freight service is not considered in the passenger service.

H. W. Crozier: What I am trying to get at is how you segregated that?

S. B. McClenegan: I do not do that myself, Mr. Crozier, and I am hardly able to answer.

H. W. Crozier: I will explain. I had an exactly similar case of some figures that were made on an alternating current road. The alternating road at Napa was investigated by a committee and the committee made a test and we obtained a showing of 157 watts per mile. That included everything. The case you stated was 137 watts per ton mile, and I would like to make the comparison. Do I understand that this measure of 4.75 kilowatts per ton mile was made on the alternating current side?

S. B. McClenegan: On the alternating current side. That included the track losses as well as the power consumed at the power house.

H. W. Crozier: Everything? How did you get the mileage result from your car result? How did you decide how much power was used by the freight and how much by the passenger?

S. B. McClenegan: That is a matter that our electrical people do and I am not familiar with the method they arrive at it, except that it is carefully segregated.

H. W. Crozier: The point I want to make is that I am very much surprised at the figure 137, and I am just wondering if the report is not a little bit low.

S. B. McClenegan: Of course, as I explained, you have me somewhat in a door; you know I am not an electrical engineer.

H. W. Crozier: I understand, but the point I want to make out is that you have a meter which measures all the power consumed by the road.

S. B. McClenegan: Yes, on the alternating current side.

A. W. Crozier: Yes, at so many watts; and what I was trying to get at was how did you consider how much power the locomotives and everything else used?

S. B. McGlenegan: We know the number of miles they operated and of course we know the express cars are not geared up to the same ratio as the passenger cars. As I say, I did not personally make these observations and therefore am unable to tell you how Mr. Evans arrived at it. I would be very glad to do so, and if you are interested further in the matter I would be very glad to have him make a report.

H. W. Crozier: I would be very glad to see that, because wherever you put straight locomotives on, it greatly reduces the watts per ton mile. On the Pasadena line we got the rate down to fifty. We hauled gravel, and it made all the difference in the world. The management wondered why the Santa Ana station was so different from the others.

S. B. McClenegan: In connection with this equipment, gentlemen, I would be glad, if any of you ever wander so far away as Stockton, to see you either singly or as a whole, and would be glad to give you a car to do what you please with, so long as you bring it back again. In that way I think you can really learn more of the equipment that I have been trying to tell you of than I could give you in a month. So that if you come singly or in a body I would be ever so glad to do everything I can to show you everything there is.

Carl Heise: Is your freight run in the day time or night time?

Mr. McClenegan: Daytime, although in some seasons of the year, the fruit season, the freight is largely handled at night. But at this season of the year it is in the daytime.

These results that were quoted of tests made by the American Institute on the Napa road was on a total for two months, showing the ratio at 151. The engineer tells me that that comparison with the new equipment has been reduced to 148 now. This is a figure that we are pretty well satisfied is correct. There were quite a number of engineers there at the time record was made. I was there the other day and saw some of the things Mr. Heise spoke about, and it certainly looks pretty good, 200,000 miles for an armature without being taken out.

The Chairman: I am sure that we all appreciate Mr. Mc Clenegan's invitation to wander as far as Stockton.

Mr. Chairman: We would be very pleased to hear from Mr. Hearn. Mr. Crozier says he is present this evening.

G. A. Hearn: We have had some queer experiences in the last few months, and the figures I gave Mr Crozier are not the best we have had by any means. We are collecting data but we will come down here soon with some figures that will surprise you. We have some equipment that has been running a little over 75,000 miles and not a motor has needed any repairs; the control apparatus is the same as when we started; we made some changes in our gear ratio. There are a good many stops and we have to make high speed as the boats come in late invariably and we try to keep our schedules. That makes it hard to operate with a high speed ratio. But when we bring those figures down that I have spoken about I will show you how we are doing it.

W. J. Davis Jr. (Communicated): The watt hours per ton mile given by McClenegan for the Central California 1200-volt direct current road and by Mr. Hearn for the Vallejo Benicia & Napa Valley single-phase road afford a very interesting comparison in energy consumption. Mr. Hearn's road uses a 45-ton motor car hauling a 28-ton trailer, making an average weight per car 36½ tons empty, or 39½ tons loaded. We therefore derive the following comparison:

	1200-volt D. C.	Single-phase.
Average weight of car with passenger load..	35 tons,	39½ tons
Watt hours per ton mile input to sub-station . .	135	148
Kilowatt hours per car mile	4.73	5.85

Kilowatt hours per car mile saving in favor of 1200-volt direct current, 1.12 (equals 23.1 per cent).

In each instance power is received at the sub-station at 60 cycles and is changed by means of motor generator sets to 1200 volts direct current in one case and 330 volts single-phase in the other.

Considerable improvement in the energy consumption of the Central California Traction Company's cars may be expected as extensions are made and the load factor improves. The motor generator sets are now carrying less than one-half the load that will be put on them when the road is completed.

We must rid ourselves of the notion that the single-phase equipment is something cheap, designed for the especial benefit of those roads having a light income and requiring a correspondingly light service. On the contrary, the single-phase equipment is used to best advantage in high class, high speed service on a single track road. The electrical equipment alone weighs 45 to 50 per cent more than a direct current electrical equipment of equal rating, and the space required under the car body for installation is considerably greater, making it necessary to use a car weighing fully equipped not less than 45 tons when four 75 h. p. motors are used. When the equipment consists of four 125 h. p. motors, the weight of the car complete varies from 55 to 68 tons. Heavier cars and higher speeds require the use of heavier rails, heavier ballast for the road bed and more expensive bridges than would ordinarily be required. These items all have their effect in adding to the maintenance and operating cost and their value is in no way influenced by a possible reduction in motor maintenance.

The 1200-volt direct current equipment on the other hand permits the use of a comparatively light car and lighter roadbed construction, and that it is admirably adapted to economical and satisfactorily interurban service is well demonstrated by Mr. McClenegan's paper. It is a significant fact that the interurban roads in this country making the best records as to cost of operation and net income above operating expenses are those using direct current motors, either 600 or 1200 volts. The full appreciation of this condition by engineers and financiers is responsible for the steadily increasing popularity of the 1200-volt system.

THE JOHN FRITZ MEDAL PRESENTATION CEREMONY.

The John Fritz Medal for 1909 has been awarded by the Board of Award specially selected for the purpose and consisting of four members of each of the National Engineering Societies, to Mr. Charles T. Porter, Hon. Mem. Am. Soc. M. E., for his work in advancing the knowledge of steam engineering, and in improvements in engine construction.

The public ceremony of the presentation of the medal to Mr. Porter yill take place in the large auditorium of the Engineering Societies Building, No. 29 West Thirty-ninth street, New York, at 8:30 p. m. on Tuesday, April 13, 1909. It is the wish of the Board to give distinction to the event and to make these awards year by year memorable and fittingly conspicuous.

Besides the simple ritual of the presentation of the medal, in the presence of invited guests and distinguished representatives of engineering, there will be addresses by representatives of the four groups of the profession most concerned.

"The Debt of Modern Industrial Civilization to the Steam Engine as a Source of Power"—Dean W. F. M. Goss of the University of Illinois, Mem. Am. Soc. M. E. and Am. Inst. E. E.

"The Debt of the Modern Steam Engine to Mr. Charles T. Porter"—Prof. F. R. Hutton of Columbia University, Hon. Sec. Am. Soc. M. E.

"The Debt of the Era of Steel to the High-Speed Steam Engine"—Mr. Robert W. Hunt of Chicago, Mem. Am. Soc. of E. and Past Pres. Am. Soc. M. E. and Am. Inst. C. E.

"The Debt of the Era of Electricity to the High-Speed Steam Engine"—Mr. Frank J. Sprague of New York, Mem. Am. Inst. M. E. and Am. Soc. C. E.

JOURNAL OF ELECTRICITY
POWER AND GAS

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FOUNDED 1887 AS THE
PACIFIC LUMBERMAN, CONTRACTOR AND ELECTRICIAN

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Electricity in the Hospital

Not least important of the uses of electricity is its application in the alleviation of pain. The description of the power plant for the new hospital of the Southern Pacific Company in San Francisco is interesting to electrical engineers, but the fact that the electric current is now being used to palliate the sufferings of hospital patients concerns us all.

First in hospital service is the question of light, and in this regard every precaution has been taken to insure a continuous as well as complete service. Light is not only a matter of convenience, but it also obviates that inherent dread of being sick in the dark that is common to all. In this installation comfort and convenience is insured by the use of electric elevators and electric heating appliances. Safety is provided by the means of numerous electric calls, so at no time can the patient be out of direct communication with the nurse.

The institution is said to be the most complete industrial hospital in the United States, and stands as a monument of the thoughtfulness and skill of the surgeon as supplemented by the ingenuity of the architect.

Rate for Charging

With the increase in sales that has followed the organization of the Pacific Coast Electric Vehicle Association and bodies of like character throughout the country, there has arisen the question as to the proper price to be charged for charging storage batteries. It does not seem fair that the same flat rate should apply to all machines, no matter what the battery resistance or degree of exhaustion. Rheostat losses are greater for batteries with a small number of cells than with those whose counter electro-motive force approximates that of the charging current. It does not seem just that the man whose battery requires a partial charge should pay the same price as the one to whom a full charge is delivered.

To solve this difficulty it has been proposed that the rate be based on the mileage, but this does not seem as logical as would be a basic charge per kilowatt hour, the scale being so adjusted that large users may get a wholesale price. This not only protects the garages against loss, but also is an assurance that each machine gets for what it is paying.

The further question of establishing a uniform rate for maintenance is one that concerns only garages in the same community. It is one to be decided by mutual agreement in accordance with local conditions, As noted elsewhere, these questions are being agitated by members of the Pacific Coast Electric Vehicle Association and require concerted effort for standardization.

PERSONALS.

H. S. DeLancie has joined the San Francisco office of the Westinghouse Electric & Manufacturing Company.

W. S. Berry, with the San Francisco office of the Western Electric Company, has returned after a four weeks' trip East.

Clem A. Copeland of Los Angeles is temporarily filling the chair of professor of electrical engineering in the University of Montana, Missoula, Mont.

A. E. Wood, formerly with the Trumbull Electric Manufacturing Company, is engaged in construction work for the Northern Pacific Irrigation Company, at Seattle, Wash.

J. G. White & Co., engineers and constructors, have opened a branch office in the Alaska Commercial building, San Francisco, under the management of Mr. Henry A. Lardner.

J. E. Wickstrom, who has been with the Seattle-Tacoma Power Company, Seattle, Washington, for the past two years, has opened an office in the Central building, Seattle, as consulting engineer.

Otto Niesser, manufacturers' representative of Los Angeles, has returned from a trip through the Northwest and is spending a week in San Francisco. He is planning to leave for Los Angeles early next week.

L. D. Hitzeroth has resigned as electrical engineer of the Century Electric Construction Company, San Francisco, to become superintendent of power houses for the Nevada-California Power Company, at Bishop, Cal.

Mr. Frederic P. Vose, an attorney of Chicago, and national secretary of the Electrical Trades Association, is in San Francisco and will be in attendance at the annual meeting of that association, which takes place on April 17th.

K. McCaskill, for two and a half years in the electrical engineering department of the New York Central & Hudson River Railroad Company, is now in the service of the Southern Pacific Railroad in the electrification of their suburban branches in Oakland, Alameda and Berkeley.

F. C. Sievers, formerly with the San Francisco office of the Crocker-Wheeler Company, is now a member of the San Francisco sales force of the Fort Wayne Electric Works. Owing to the increase in the business of the Fort Wayne Electric Works, the Sprague Electric Company and the Northern Electric Manufacturing Company, these interests have been compelled to increase their office space and are now occupying the entire fourth floor of the Atlas building, San Francisco.

NEWS OF THE STEAM ENGINEERS.

On Wednesday evening, April 7th, the Educational Committee of California No. 3, National Association of Stationary Engineers, favored the members with an interesting and instructive talk on electric motors, by Mr. J. Henry Klinck of the Westinghouse Electric & Manufacturing Co.

A general explanation of the action of the electric motor was given by means of sketches showing the necessary relation between the magnetic fields set up by the armature and field windings to cause rotation and the necessity for the commutator for the direct current motor shown.

Passing to the alternating current motor the method of obtaining the rotating field was outlined and the action of this field on the winding of both squirrel cage and polar-wound secondaries shown. Emphasis was laid on the fact that in the alternating current motor of the cage wound type there is no necessity for any moving or exposed contacts as the current in the secondary winding has no direct connection with the source of supply. The only parts of this motor subject to wear are the bearings and proper design obviates any danger from this source. The use of starting devices for motors was briefly touched on.

Various motor ratings were explained and the reasons for giving a motor a certain horse-power rating of one kind of service and a different one for another class shown. Speed-load curves of the various classes of windings of both alternating and direct current motors were shown and a parallel drawn between the behavior under various loads of constant speed motors and the automatic steam engine and the simple steam engine operating without a governor under the same conditions.

In conclusion it was stated that only by making a careful study of the conditions under which a motor is to operate is it possible to select the proper type of motor to use to meet all requirements.

(a) CONSTANT SPEED MOTORS in which the speed is either constant or does not materially vary, such as synchronous motors, induction motors with small slips, ordinary direct current shunt motors and direct current compound wound motors, the no load speed of which is not more than 20 per cent higher than the full load speed.

(b) MULTISPEED MOTORS (two-speed, three-speed, etc.) which can be operated at any one of several distinct speeds, these speeds being practically independent of the load, such as direct current motors with two armature windings and induction motors with primary windings capable of being grouped so as to form different numbers of poles.

(c) ADJUSTABLE SPEED MOTORS: (1) Shunt Wound Motors in which the speed can be varied gradually over a considerable range, but when once adjusted, rmains practically unaffected by the load; such as motors designed for considerable range of speed by field variation. (2) Compound Wound Motors in which the speed can be varied gradually over a considerable range as in (1) and when once adjusted, varies with the load similar to compound wound constant speed motors or varying speed motors, depending upon the percentage of compounding.

(d) VARYING SPEED MOTORS or motors in which the speed varies with the load, decreasing when the load increases such as series motors and heavily compounded motors. Examples of heavily compounded motors are those designed for bending roll service and mill service, in which a shunt winding is provided only to limit the light load operating speed.

GOLF TOURNAMENT OF THE JOBBERS.

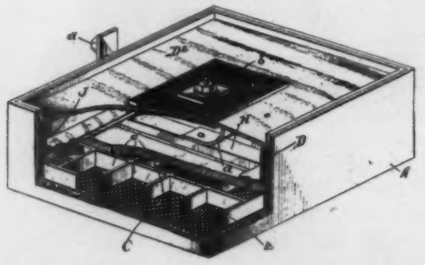
The Electrical Jobbers' Association of the Pacific Coast will hold its next meeting at Del Monte, California, on April 24th, 25th and 26th, at which time a second golf contest for the Del Monte cup will take place. The cup, which is a handsome trophy of burnished copper with silver mountings was won at Del Monte on January 17th by W. L. Goodwin of San Francisco and it is to remain in his possession until some player of superior ability or greater fortune can wrest it from him. The schedule of handicaps has been based on the play of January 17th and the coming contest promises to be of great interest.

ELECTRICAL TRADES ASSOCIATION.

The annual meeting of the Electrical Trades Association will be held at the Hotel Argonaut, San Francisco, on April 17th. In connection with this meeting a luncheon of the members will take place at one o'clock, to be presided over by Mr. Albert H. Elliott, Secretary. Five minute talks will be given by several of the members as well as some representative people outside of the association, who have been invited to be present at the luncheon as guests. The presence of Mr. Frederic P. Vose of Chicago, the national secretary of the association, will add materially to the interest of the meeting.

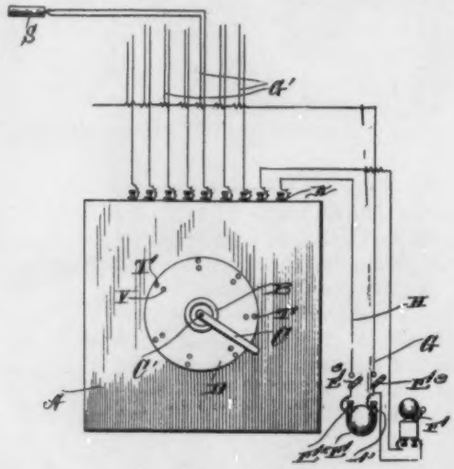
PATENTS

916,575. Secondary Battery. William Morrison, Chicago, Ill. In an electric reversible galvanic battery in which there is a suitable alkaline solution, zinc as the positive active element, a negative-pole electrode disposed at or near the bottom of the cell in substantially a horizontal position so that gravity tends to cause the active material to remain in contact with the negative-pole electrode, and a positive electrode above the negative-pole electrode, together with mercury in contact



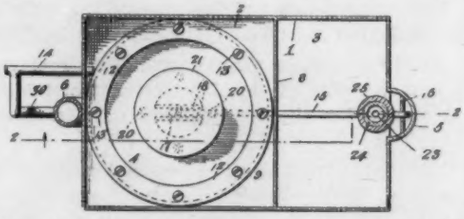
with the negative-pole electrode, the mercury reamalgamating the negative-pole electrode in each successive charge, and insulating means between said electrodes adapted to subdivide the body of electrolyte therebetween, said zinc being greatly in excess of that which the electrolyte can dissolve, whereby the excess of zinc is oxidized by said electrolyte without dissolving, thereby producing an electric current.

916,476. Electrical Shot-Firing Machine for Mines. Walter B. McLarty, Wilburton, Okla. An electric shot-firing apparatus for mines, comprising a generator, a rotatable controller arm, circuit closers mounted upon said arm, means for operating the latter, a conductor ring against which one of



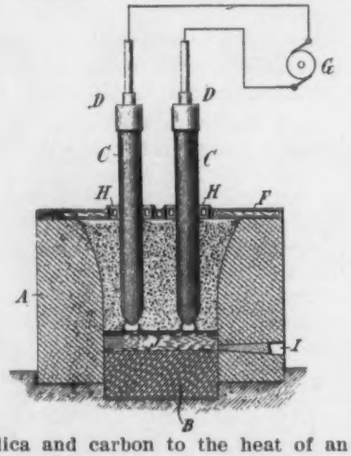
said closers is constantly in contact, electrical connections between said conductor ring and source of energy, a series of contact points against which the circuit closers upon said arm are adapted to contact at predetermined moments, electrical connections between said contact points, the source of energy and the charges to be fired, and an electric signal in the circuit with said ring.

916,943. Gas Pressure Regulator. Roy A. Doane, Palo Alto, Cal., assignor of nine-twentieths to N. B. Nelson, Palo Alto, Cal. In a pressure regulator, the combination of a casing having a partition provided with an opening, a diaphragm secured over the opening in the partition to separate the casing into a gas chamber and an air chamber, the air chamber having an air vent opening and the gas chamber having an inlet and an outlet, an inlet pipe projecting through the inlet opening in the casing, said pipe being internally screw threaded and having its projecting upper end externally threaded, the lower end of the pipe within the gas chamber having a smooth bore and a slot in one side, an externally



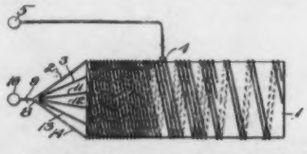
threaded tubular valve seat arranged in the internally threaded portion of the pipe, the lower end of said valve seat being cone-shaped and disposed opposite the slot in the lower end of said pipe, a lever within the gas chamber fulcrumed at one end and pivotally connected at its other end to said diaphragm, a valve fixed to the lever intermediate its ends and adapted to project into and be guided by the smooth bore of the lower end of said pipe, and a packing upon the top of the valve to engage the cone-shaped lower end of the adjustable valve seat.

916,793. Production of Silicon. George O. Seward, East Orange, N. J., and Franz von Kugelgen, Holcombs Rock, Va., assignors to Virginia Laboratory Company, New York, N. Y. The process of producing silicon by subjecting a porous



mixture of silica and carbon to the heat of an electric arc, whereby said mixture is reduced and the silicon is volatilized, while maintaining the arc deeply buried under such mixture, whereby a cooler zone is maintained around the zone of reduction in which the silicon vapor is condensed.

916,541. Variable Inductance Winding. Melville Eastham, Boston, Mass., assignor to Clapp-Eastham Company, Boston, Mass. In a variable inductance winding, a plurality of inductance wires wound in parallel side by side, and a contact



movable transversely of the turns of said winding into circuit-closing relation with adjacent turns of said wires successively, the arrangement being such that no two turns of the same wire shall at any time be bridged by said contact.

THE PACIFIC ELECTRIC VEHICLE ASSOCIATION.

The campaign to develop the latent possibilities of the electric vehicle, which was launched less than two months ago, has met with a hearty support, not only from the dealers but also from the central station men who are progressive enough to see the opportunities for equalizing their load. This movement, which had its inception in the West with the organization of the Pacific Coast Eelectric Vehicle Association, has subsequently developed in Boston, Cleveland and Chicago with the perfection of similar organizations.

From Boston comes the "Electric Vehicle and Central Station," an attractive monthly magazine "devoted exclusively to the electric vehicle and its motive power." Many of the electrical papers of the country are devoting considerable space to the subject, as are also a number of daily newspapers. An example of this is shown in the accompanying clipping from the Seattle Post-Intelligencer, "Treat a Battery as You Treat a Horse," and in the advertisements of the Portland Railway Light and Power Company in the Portland papers advising people to use electric automobiles for city and suburban use.

The chief work accomplished by the Pacific Coast Electric Vehicle Association thus far has been in advising its members of prospective purchasers. The association has at its command men experienced in the construction and operation of electric vehicles, and members are solicited to submit any questions or problems which have bothered them; these will be answered in the Question and Answer Department.

Plans are being laid for a meeting of the association in Seattle during September or October. In addition to the large number of vehicles in regular use in the Northwest there is to be quite an exhibit of electric vehicles and motor boats at the Alaska-Yukon Exhibition and members in the Northwest are enthusiastic as to the good that can be accomplished by such a meeting.

The question has arisen as to what is the proper rate for charging. It is proposed that a uniform scale be established and maintained; many are in favor of a sliding scale based upon the kilowatt hours or mileage demand as opposed to a flat rate based on a general average. Discussion is invited upon this question in order that intelligent action may be taken thereon.

In conclusion the secretary would urge the active support of all members in sending in items of new sales and shipments to be published in this department. Mr. Fred T. Kitt of Sacramento writes that he has sold a car load of Columbus pleasure vehicles and has two more car loads on the way. The Sacramento Electric Gas and Railway Company have bought a Columbus runabout for the use of their office and another purchaser has bought a 1200-pound Waverly delivery wagon. Other members have possibly done as well and should not be backward in letting it be known. Interesting articles have been received from a number of electric vehicle men and will be published monthly in this department, which will be enlarged in accordance with the amount of material received from members.

TREAT BATTERY AS YOU TREAT A HORSE.

The same thought and attention that every intelligent man bestows on a horse should be applied to the battery in his electric vehicle, and the same degree of intelligence required for the care of a valuable horse is sufficient for proper management of a battery. The rules to be followed are expressed in different words, but it is curious how closely they parallel the rules that apply to a horse.

Charging a battery, for instance, is much like feeding a horse. It should be done regularly, at the proper time and within proper limits. If one were driving a horse on short trips about town he would not feed him at every hitching post. Neither should be put his battery on charge every time he houses it in the garage. One should wait until the battery has been discharged down to a certain point, and then give it a full charge. A full charge, however, does not mean overcharging any more than a good feed means overfeeding. Overfeeding a horse may produce fever and just so overcharging will raise the temperature of the plates unduly and injure them.

On the other hand, no one would work a horse until it had used up the last item of strength in its body, and so you should not use a battery until every volt of current has been discharged. The rule is not to discharge a battery below 1.70 volts per cell—or for a 30 cell battery 51 volts. That is just the way you should treat a horse. Again, if your horse has been worked to pretty near the limit of its strength you do not allow it to stand long in the barn without a feed. Just so with a battery. It should be kept charged, whether you are going to use it or not. The battery should always have a sufficient supply of water. This is just as true of a horse, though for a different reason; but water is quite as essential to the battery as it is to the horse and the strength and vitality of one cannot be maintained any more than the other without water. The analogy might be pushed too far, but it is a general truth that if a man will give the same intelligent consideration to the needs of his storage battery as to those of a "hay motor" the care of an electric vehicle will prove far easier to him than that of any horse and the satisfaction of its use far greater.—Seattle Post-Intelligencer.

Electric vehicles in London are allowed in Hyde Park during certain hours in July, August and September. Other automobiles are prohibited. About 450 licenses have been issued for electric vehicles in London.

The electric vehicle at the National Electric Light Association Convention at Atlantic City, in June, will be a prominent factor. In addition to exhibits of the latest types of machines there will be shown storage batteries and other pertinent equipment.

A transportation exhibition to be known as the International Exhibition of Railways and Land Transport is to be held at Buenos Ayres, Argentine Republic, from May to November, 1910. This is in connection with the forthcoming celebration of the hundredth anniversary of the independence of the Argentine Republic.

INDUSTRIAL

DELTABESTON MAGNET WIRE.

Since Deltabeston magnet wire was first placed upon the market, every effort has has been made to improve its excellent qualities. Only the purest fibre is used in the insulation and this is so treated that it is indestructible, so far as any temperature rise to which it may be subjected in actual service, is concerned. In addition to being heat-proof, Deltabeston wire is also made wa'er-proof by thoroughly impregnating the insulation with a compound which prevents the absorption of moisture.

Deltabeston wire is today a necessary element in all service where extreme overloads play an important part and is especially suitable for the use in the manufacture and repair of railway motors, crane motors, air pump motors,

mill motors, lifting magnets, controller blow out magnets and arc lamps. Recently tests have been made to compare the properties of this wire with those required and covered by the U. S. government specifications. The specification reads in part as follows:

> "When subject to a temperature of 160 degrees C., neither the asbestos covering nor the water-proof compound shall be injuriously affected. Six-inch samples of wire, with carefully paraffined ends shall be immersed in fresh water at a temperature of 22 degrees C. for a period of 24 hours. The per cent of water absorbed by the insulation during such immersion shall not exceed 4 per cent."

As the result of these tests Deltabeston magnet wire more than fulfilled the requirements and the contract was awarded to the D. & W. Fuse Company.

TRADE CATALOGUES.

"Quality Telephone Cords" is an illustrated bulletin (No. 47) issued by the Kellogg Switchboard & Supply Co., Chicago, Ill., and San Francisco, Cal.

"San Francisco and Roundabout" is a collection of beautiful scenes in the region indicated. It has been copyrighted by the San Francisco Sight-Seeing Company and may be obtained from the railroad companies.

"Jandus Fans for the Electrical Contractor" is the title of a neat booklet from the Standard Electrical Works, San Francisco. A short description of various types of direct and alternating current fans is supplemented by detailed directions for installation.

Circular No. 1502 from the Westinghouse Electric & Manufacturing Company, illustrates and describes Westinghouse distributing transformers, potential regulators, lightning arresters and insulators. It contains information of value regarding the installation of transformers, the use of underground systems of distribution and other data of interest to central station men.

A bulletin on rural line construction (No. 45) issued by the Kellogg Switchboard & Supply Co., Chicago, Ill., and San Francisco, Cal., will prove of interest at this time to telephone men. It is carefully illustrated, showing the best practice in setting poles, guying, bracing and wiring. Explaining the different wind and other strains, and the importance of careful guying; gives transposition brackets, insulators, arms, arm braces, etc. Tools required in line and telephone work and costs. Also the forms and contracts, constitution, by-laws and rules of order generally used by farm companies.

A NEW ARC LAMP FOR TWENTY-FIVE CYCLE CIRCUITS.

The pulsations of a 25-cycle enclosed carbon arc are visible to the eye. Light emanating from such a source cannot be considered satisfactory for many classes of artificial illumination, and will not ordinarily be used in any case where a more suitable circuit is available.

With the more extensive use of lower frequency alternating current for railroad and stationary motor power, there are parks, railroad terminals, factory buildings, and factory yards to be lighted. For such general illumination the 25-cycle enclosed arc is being used and considered satisfactory. Heretofore, the only enclosed arc lamp available has been a modification of some lamp designed for higher frequency circuits, such modifications consisting of the use of extra or

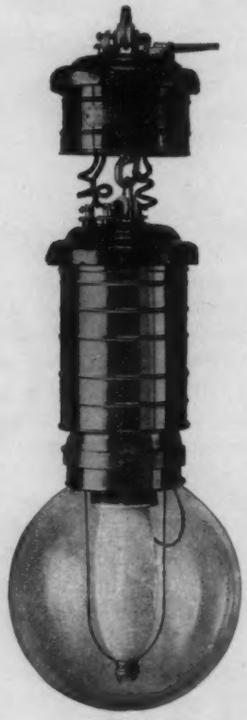


Fig. 1.

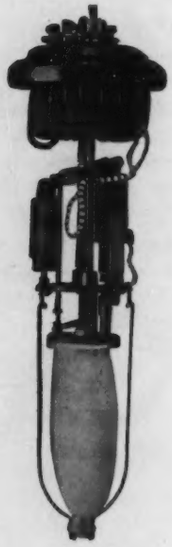


Fig. 2.

more flexible springs to take up the extreme vibration of the mechanism. A construction embodying the use of very light springs is decidedly questionable as such springs must stand the strain caused by the inrush of starting current.

Figure 1 shows the external appearance, and Figure 2 the mechanism of a lamp designed by the General Electric Company to meet these exacting requirements.

The frame is of the well-known two rod type. The mechanism consists of a rocker frame carrying the lamp magnet and suitable current adjusting counterweight. The armature is of standard laminated construction, but is stationary and held rigidly to the lamp base casting. By the use of this considerable weight in the moving element, and by making the armature a part (mechanically) of the lamp frame, all objectionable vibration is absorbed or deadened, thereby permitting the elimination of all springs. The lamp is as quiet and free from vibration in starting and operating as standard lamps for higher frequencies.

Where this lamp is to be operated on 220 or 440 volt circuits an external as well as internal compensator must be used (fig. 1) and a third binding post placed on the lamp top, while for nominal 110 volt circuits the lamp is self-contained.

NEWS NOTES

FINANCIAL.

COALINGA, CAL.—The Judges Oil & Mining Company has levied an assessment of five cents per share on the capital stock of the company.

SAN FRANCISCO, CAL.—The San Lucia Oil Company has levied an assessment of 44 cents per 100 shares on the capital stock of the company.

SAN FRANCISCO, CAL.—District Judge Van Fleet has issued an order in the United States Circuit Court for the sale of the properties of the Tuolumne Water Power Company and the Stanislaus Electric Power Company on May 10, 1900, at the court house building, Sonora, Tuolumne county, to satisfy the mortgage of the Knickerbocker Trust Company, New York.

SAN FRANCISCO, CAL.—The Clear Lake Northern Railroad Company has mortgaged all its real property and easements to the Mercantile Trust Company of this city, for $1,000,000, to guarantee a bond issue of that sum to be used in improvements and construction. The proposed road will run from Pieta, Mendocino county, to Lakeport, Lake county, a distance of 31 miles.

OAKLAND, CAL.—The Security Bank & Trust Company, the Oakland Bank of Savings, the First National Bank and the Central Bank, have arranged to take complete control of the People's Water Company of this city. These four banks will advance the money needed to pay off the water company's floating debt and to make the improvements and extensions which have been badly needed since the earthquake.

SAN FRANCISCO, CAL.—The following estimates of value of the Spring Valley Water Co.'s plant have been made: President Bourn's figure, $40,000,000; city's valuation, $24,000,000; F. L. Sterns, $70,000,000; James D. Schuyler $45,960,000; Herman Schussler, $51,500,000; Rudolph Hering, $44,770,900; Arthur L. Adams, $40,000,000; C. E. Grunsky, $24,673,212; J. H. Dockweiler, $24,053,390; Desmond Fitzgerald, $22,736,643; price at which company offered to sell, $32,000,000; par value of company's securities, $32,000,000; market value based on recent sales, $25,000,000. Thus, a difference of $16,000,000 remains to be settled between the city and the company before a bargain can be made.

INCORPORATIONS.

RIVERSIDE, CAL.—The Union Water Company has been incorporated here with a capital stock of $25,000 by C. M. Burket, E. C. Kennedy, J. Mill and E. E. Peck.

SAN BERNARDINO, CAL.—The San Gabriel Valley Home Telephone Company has been incorporated here with a capital stock of $2,000 by H. F. Metcalf, H. V. Carter, E. O. Fawcett, E. E. Bailey and W. M. Northrup.

SAN FRANCISCO, CAL.—The San Benito Light & Power Company has been incorporated here with a capital stock of $250,000 by Charles W. Waller, Percy M. Reeves, Thomas P. Pheby Jr., H. P. Pitts and H. M. Wright.

SAN FRANCISCO, CAL.—The Smith River Electric Company has been incorporated here with a capital stock of $250,000 by D. C. Demarest, E. C. Hegler, S. Harris, C. M. Lindsay, W. P. Swart, A. V. Massy and Carl Senn.

RIVERSIDE, CAL.—The Corona Union Telephone & Telegraph Company has been incorporated here with a capital stock of $25,000 by J. G. Jamesson, E. J. Generaux, C. M. Scottville, G. E. Snidecor, W. L. Prizer, W. L. Peelerf and D. Lord.

RENO, NEV.—The Lander County Power & Light Company has been incorporated here with a capital stock of $200,000. The company proposes to construct electric power, telephone and telegraph lines in the state of Nevada.

FRESNO, CAL.—The Sierra Park Company has been incorporated here with a capital stock of $100,000 by C. K. Kirby, John W. McLaughlin, C. K. Kirby, Jr., F. K. Kirby and D. C. McLaughlin. A power plant will be built near the headwaters of the San Joaquin river.

OAKLAND, CAL.—The Central Oakland Light & Power Company has been incorporated here with a capital stock of $1,250,000 by A. M. Hunt, James Fisher, J. K. Moffitt, M. S. Wilson, M. D. Levenson, F. G. Cartwright and C. N. Beal. A site has been purchased for its plant on Alice street, between First and Second.

PETALUMA, CAL.—The San Antonio Telephone Association has been organized here with James Sorensen as president and Nels Mastrup as secretary. Other directors are: G. B. Lavaroni, M. Fillippini and W. Leper. A rural telephone line will be constructed between Petaluma and the San Antonio country.

SAN FRANCISCO, CAL.—The Sacramento Valley Power Company has been incorporated here with a capital stock of $800,000 by P. C. Morf, H. C. McPike, L. Q. Haven, J. J. Dailey, J. F. McCue, F. W. Nightingill and E. A. Potter. Work on the construction of reservoirs and other adjuncts of a power system will begin this summer.

SAN FRANCISCO, CAL.—The Equitable Light & Power Company has been incorporated here with a capital stock of $750,000. The company proposes to supply electricity, hot water and steam to consumers. Plants are about completed in the Phelan and Whitney Buildings. Another plant is to be built outside the city. The incorporators are F. G. Cartwright, A. E. Long, L. G. Meyberg, M. S. Wilson, M. D. Levenson, C. N. Beal and Jas. Fisher.

TRANSMISSION.

OXNARD, CAL.—The Ventura County Power Company is to construct an electric power line to the Converse ranch on the Santa Clara river.

CHICO, CAL.—The Sierra Electric Power Company has been granted a franchise to erect an electric power distributing system in this city.

SANTA BARBARA, CAL.—Bids will be received up to May 6, 1909, by the city council for a franchise to erect an electric power distributing system in this city.

SANTA BARBARA, CAL.—The Pacific Improvement Company has been granted a franchise to construct an electric light and power line between this city and the Hope Ranch.

FRESNO, CAL.—The San Joaquin Light & Power Company has asked for a franchise to erect an electric power line through the Academy country to Sanger, a distance of 19 miles.

PARKER, ARIZ.—T. M. Drennan, J. L. Curtis, Fred T. Bragonier, C. F. Shades and Le Roy Anderson have been granted a franchise to construct an electric power plant and water works in this city.

RED BLUFF, CAL.—The Siskiyou Electric Power & Light Company will begin work on its new plant this spring. Jessie H. Churchill has been chosen president. The management proposes to install machinery capable of developing 60,000 horse-power.

ILLUMINATION.

PORTLAND, ORE.—New bids will be received for lighting the streets on three and five-year contracts.—City Auditor Barbur.

FORT BRAGG, CAL.—The Fort Bragg Electric Company will enlarge its plant by installing a 750 kilowatt dynamo and a steam turbine engine this summer.

CHICO, CAL.—Manager E. W. Florence of the Pacific Gas & Electric Company announces that henceforth the minimum rate on electric meters will be $1 per month instead of $2.

SAN LUIS OBISPO, CAL.—President W. F. Broadman of the San Luis Gas & Electric Company visited this city last week and announced a number of improvements to the company's plant. Over four miles of new gas mains are to be constructed this spring.

TRANSPORTATION.

SAN RAFAEL, CAL.—S. A. Moss has applied for a franchise to construct an electric line between Manzanita station and a point above Coyote Creek.

MODESTO, CAL.—The Modesto Interurban Railroad Company has let contracts for the construction of five miles of roadbed to connect the Modesto line with the Santa Fe. Active work will commence next week.

RENO, NEV.—The following directors have been chosen to manage the Nevada Interurban Railroad Company for the next year: Louis Berrum, Charles Sadlier, George Perkins, Fred Grob, John Evans and Sam Rosenthal. Louis Berrum was chosen president and Sam Rosenthal secretary.

SACRAMENTO, CAL.—George W. Peltier, of the Central California Traction Company announces that the company will establish a car factory just outside of this city near the State Agricultural Society's grounds. In addition to the manufacture of cars repair shops will be installed for repairing the company's rolling stock.

SAN FRANCISCO, CAL.—Health Officer R. G. Brodrick, Superintendent E. D. Gibbs, and Special Investigation Officer W. E. Rice have reported on the cleanliness of the cars and car barns of the United Railroads Company. Sixty-five men are employed to wash the 580 cars which the company operates daily on its lines. The car barns are stated to be kept in good condition.

NEVADA CITY, CAL.—L. W. Storror, the Pacific Coast representative of the Postal Telegraph & Cable Company, recently visited this city for the purpose of interviewing Supervisor Bigelow, relative to securing rights-of-way through the Tahoe National Forest for a telegraph line. The company proposes constructing a line from Sacramento to Salt Lake City and other Eastern points.

OAKLAND, CAL.—The Oakland Traction Company began operating last week 20 new cars on its suburban line between Oakland and Haywards. These cars, which are products of the company's shops at Emeryville, are considered to be equal to any of the street railway rolling stock about the bay. A new timetable is to be installed this week and the terminus of the line is to be Twelfth and Broadway.

FRESNO, CAL.—At a directors' meeting of the Fresno, Hanford & Summit Lake Railway Company, two directors, O. L. Everts and A. L. Jones, were chosen to succeed W. A. Sage and R. L. Pfeil. It was decided to change the principal place of business from Hanford to Fresno. Vice President W. E. Davis of the Cleveland Construction Company, which is to build and operate the new road, has been detained in the East and is not expected to arrive in this city before April 15th.

WATER.

SAN RAFAEL, CAL.—The Marin Water Company has been awarded a contract to lay pipe lines through Deer Park.

SAUSALITO, CAL.—Bids have been received for the necessary equipment for the $100,000 water system to be installed here.

IMPERIAL, CAL.—Plans are now under way for the construction of a municipal waterworks, which it is estimated will cost $50,000.

PLACERVILLE, CAL.—H. C. Marsh has filed a notice of appropriation of 15,000 inches of the water flowing in the South Fork of the American river.

WHEATLAND, CAL.—The Bo.ard of Trustees have awarded the Abner Doble Company a contract for supplying a 500-gallon pump and a 50 horse-power motor, costing $2,000, to be used at the municipal water works.

SANTA ANA, CAL.—The City Council has accepted the bid of the Pacific Coast Manufacturing Company for furnishing a Murry-Corliss engine, costing $10,350, at the municipal water plant.

SAN BERNARDINO, CAL.—The Pacific Coast Supply Company has been awarded a contract to furnish 9,000 feet of wrought iron pipe as per their bid, for 4-inch pipe at $31.80; 3-inch pipe, $21.88; and 1-inch pipe, $10.43.

BAKERSFIELD, CAL.—The Kern-Midway Water Company has purchased a 30 horsepower motor which is to be installed to the present water plant. The rates, which have been reduced one-third, will take effect this month.

SAN FRANCISCO, CAL.—Two of the highest officials of the Spring Valley Water Company resigned this week, J. C. Booker, chief of the departments of accounts, inspectors and collections, and J. M. Duke, the secretary of the company.

SAN FRANCISCO, CAL.—The Board of Public Works has let the contract for supplying the pipe for the auxiliary fire system to the United States Cast Iron Pipe & Foundry Co. Under the terms of the contract the city will pay $920,988.56 exclusive of the freight charges.

CHICO, CAL.—An underground water system to take the place of the present ditch system is being installed at the National Plant Introduction Gardens, near this city. Ten-inch mains nearly a mile long will cross the farm at short distances and these will supply distributing pipes to hydrants 200 feet apart.

YUBA CITY, CAL.—Contracts for furnishing the aparatus for the municipal water plant to be installed here were let to the Doak Gas Engine Company for $5,600. Other bidders were the Hampton Hardware Company of Marysville, the United Iron Works of San Francisco, the Sansom Iron Works of Stockton, Fairbanks-Morse Company of Stockton, and the Nevada Machinery Company of San Francisco.

OIL.

SAN FRANCISCO, CAL.—The Associated Oil Company has been directing its attention to the district about Coalinga and has practically ceased developing at Kern River.

SAN FRANCISCO, CAL.—J. M. Danziger and B. B. Lathbury have purchased 30 acres of the Emerald Oil Company on the west edge of the Kern river, with six producing wells.

LOS ANGELES, CAL.—According to authorities the California Oil producers are facing a crisis. A large drop in prices is looked for and steps are being taken to curtail the output until the consumption catches up. The output is now 10,000 barrels a day in excess of consumption, and growing so disproportionately that by the end of the year it would be 22,000 at the present ratio.